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DETERMINATION OF WATER IN GASOLINE AS RECEIVED—EXPOSED TO ATMOSPHERE, TO HUMID ATMOSPHERE, AND SATURATED WITH WATER

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DETERMINATION OF WATER IN GASOLINE AS RECEIVED—EXPOSED TO ATMOSPHERE, TO HUMID ATMOSPHERE, AND SATURATED WITH WATER.

GENERAL.

Considerable trouble has been experienced due to an inorganic salt deposit that forms in the carburetor. This sediment or corrosion seems to be worse when the engine is allowed to remain idle for a time after use than when in continual use.

An incomplete analysis of this sediment showed it to contain largely aluminum oxide, which contained a considerable amount of moisture. Various reports mention that this is of a slimy consistency at first, but later becomes a gray-white amorphous powder.

From these analyses and reports it was thought, under conditions of exposure to atmosphere, to humid atmosphere, etc., that sufficient water would be collected in the gasoline to cause the formation of aluminum hydroxide by the hydrolytic action of the weak acid carbonic or oxyacide.

PURPOSE.

The purpose of this investigation was to ascertain whether, under various conditions of humidity, appreciable amounts of water were absorbed by gasoline to cause this corrosion, and to investigate several methods for determining water in gasoline.

CONCLUSIONS.

The method described herein for determining small amounts of water in gasoline gave satisfactory results. The results obtained by this method showed that aviation gasoline, as received, contains only a very small per cent of H_2O— 0.006 per cent by weight; that exposure to the atmospheric conditions of humidity did not affect the per cent of water in gasoline appreciably; that exposure to atmosphere of 96 per cent humidity showed hardly any increase in the amount of water dissolved. Gasoline, saturated with H_2O at 75° F., gave H_2O to the extent of 0.009 per cent by weight.

This very small amount of water, as found in gasoline, would hardly account for the corrosion and sediment found in the carburetors.

50 c. c. sample gasoline, sp. gr. 0.7000.	Increase weight, both bulbs.	Blank.	Per cent H^2O, by weight.
	Grams.	*Grams.*	*Per cent.*
As received	0.0041 .0040 .0042	0.0028	0.004
Exposed to the air 2 weeks	.0046	.0028	.005
Exposed to humid air	.0046	.0028	.005
Saturated with H^2O at 75° F.	.0052	.0028	.007

In order to determine whether this method gave quantitative results, a drop of the H^2O was added to a Na dried sample and the regular procedure followed. Excellent results were obtained.

	Gram.
Added water	0.0111
Increased weight of bulbs	.0128—Blank of 0.0028=0.0106
Increased weight of H^2O found	.0106

DISCUSSION OF RESULTS.

An attempt to determine per cent of water in gasoline was made by means of measuring evolved hydrogen upon the addition of sodium to the sample. Satisfactory results were not obtainable, due to the very high vapor pressure of the gasoline.

The method finally employed is the one outlined by C. W. Clifford in the July, 1921, issue of the Journal of Industrial and Engineering Chemistry. Some changes were made in the apparatus, but the principle is the same.

The drying of the samples for blank and method of checking determination was accomplished by adding small pieces of metallic Na. This was then allowed to stand for two hours with occasional shaking.

The samples exposed to the air for two weeks were placed in a small-mouthed bottle and left open. Those exposed to humid atmosphere were placed in a similar container inside a humidity chamber, where an approximate humidity of 96 per cent was maintained for 48 hours.

The sample, saturated with water, was maintained at 75° F. for one hour, or until a complete separation of the excess water was accomplished.

MATERIALS.

Examinations for water content were made on samples of gasoline taken from the small truck used for filling airplane-gasoline tanks. Tests showed these samples to be of uniform quality and to comply with War Department Specification 2-40 for "Aviation gasoline."

APPARATUS.

The apparatus used in the determination consisted of two $CaCl_2$ towers for drying the air before passing it through the sample. A Meyer bulb tube contained the sample and two $CaCl_2$ U tubes filled with 20-mesh $CaCl_2$.

PROCEDURE.

A distillation curve (see fig. 1) was plotted on the sample of gasoline tested in this determination.

A 50 c. c. portion of this sample after drying with Na was placed in the Meyer tube. The two $CaCl_2$ tubes, through which dry air had been passed for 15 minutes, were weighed and connected to the Meyer tube. The dried air was passed through the sample for two hours at a rate of approximately 7 liters per hour. This gave a slight increase in weight on the bulbs, which was used as the blank on all later determinations.

In order to determine the adaptability of the method, a drop of water, of known weight, was then placed in another 50 c. c. of dried sample and run the same way as the blank.

Samples of gasoline as received, exposed to the atmosphere for two weeks, exposed to humid atmosphere for 48 hours, and saturated with water at 75° F., were next run for water content.

Care was taken not to admit moisture into the apparatus while changing the samples.

RESULTS.

The blank, as determined on a number of analyses, gave consistent results of 0.002 gram increase in weight on the bulbs.

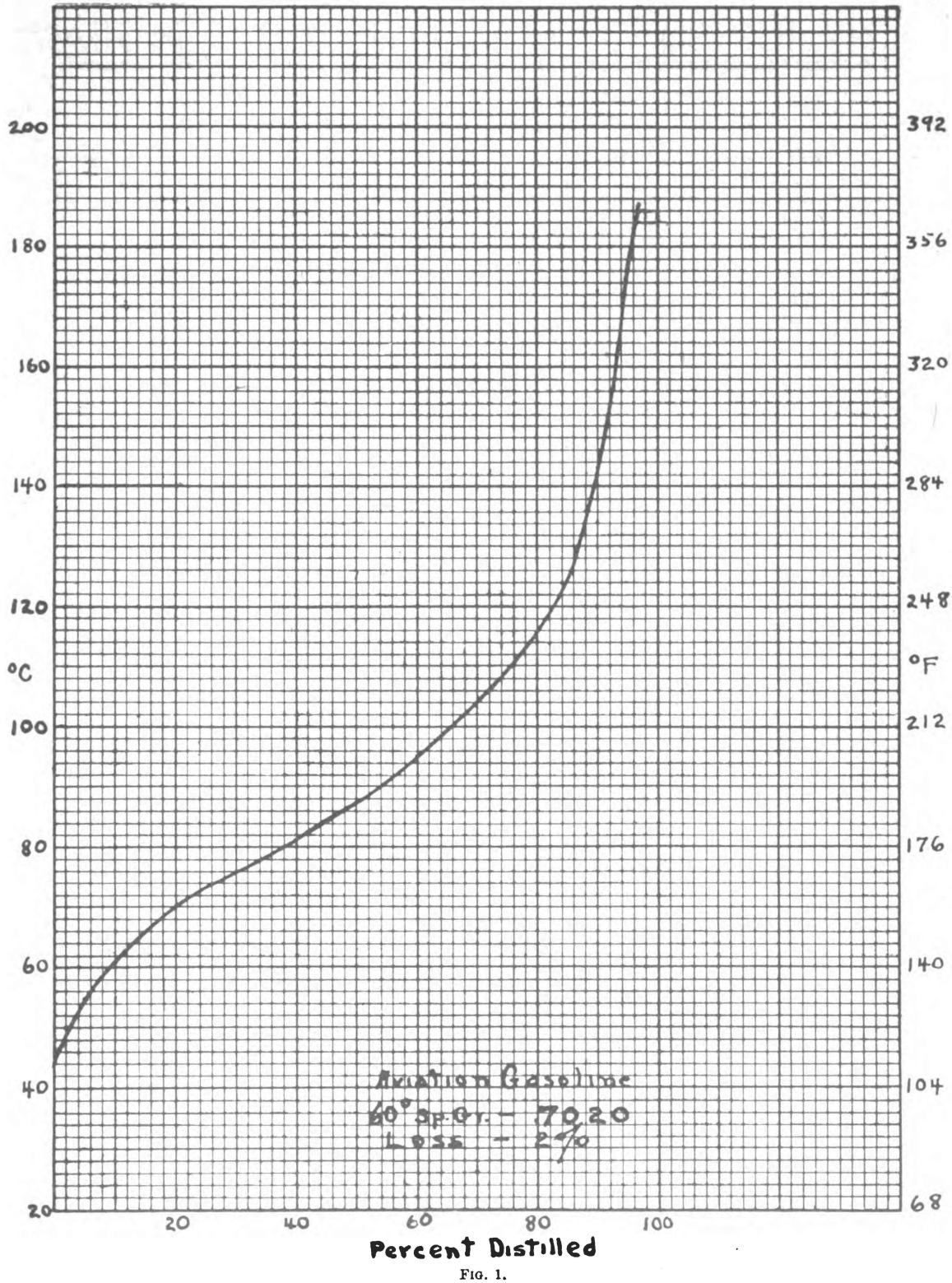

FIG. 1.